The Order of Order: Towards an Environmental Functionalism

In her call for proposals for "The Environment Schism," Lydia Kallipoliti describes the contemporary scene of environmental architecture as, "a disparate assembly of design proposals," an anything-goes scenario, in which environmental systems and architectural expression have completely and whole-heartedly detached.

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Why should environmental architecture *not* be disparate and diverse? If architecture is to respond to its environment, and if its various environments are multifarious, should not the resultant architectures be as diverse as the environments themselves? What Kallipoliti is calling out here, however, is the sinister phenomenon in which these so-called environmental projects seem to rank 'environmentality' as near—but not at—the top of their hierarchies. Above environmental response is too often an aesthetic response; one that pulls these works away from their stated goals and toward preconceived notions of order that thwart any attempts at true responsiveness. Indeed, what is missing in the disparate assembly of environmental architectures is a common communication of responsiveness. Instead, we see recurrences of self-absorbed architecture in a variety of forms, projecting an image of environmentalism but devoid of any fundamental engagment with the site and its climatic forces.

While his phenomenon occurs too frequently to necessitate examples, we might cite Foster and Partners' *30 St. Mary's Axe* as the ultimate misalignment between environmental systems and preconceived aesthetic. The glass skyscraper is an inherently unsustainable type: it is unchanging in the round, despite vastly differing climatic conditions, and its all-over glazing produces a greenhouse enclosure for a tower of heat-producing devices. The systems, lauded for their hi-tech sustainability, are applied only after these fundamental yet unsustainable moves have been made, as a remedy to the problems created by the desire for order, allsidedness, and transparency. Certainly, Foster and Partners employ technologically innovative systems, namely tinted glass and double-skin facades, to alleviate the potential over-heating, but the question remains: why is this a glass building to begin with?

As Jonathan Massey has pointed out, if the building's operable windows are not used, "*30 St. Mary Axe* is not a green tower but an energy hog." He continues:

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Figure 1: Norman Foster, 30 St. Mary's Axe, London.

"It is striking, then, that the building has been a critical and financial success despite its failure to realize one of the headline claims made about its design."[1] Inevitably, the expression of the clients' (and perhaps the architects') desires—one must assume notions of modernity, progressiveness, innovation, transparency—supersede the actual climatic responsiveness at the level of fundamental design.

This strange order of things is of course as old as architecture itself. As I have previously pointed out*, in "On Climate as Determining the Style of the House," Vitruvius opens an early discussion of context by comparing climatic variation in the human body to architectural variation. The segment begins with the commonsense statement that, "as the position of the heaven with regard to a given tract on the earth leads naturally to different characteristics, owing to the inclination of the circle of the zodiac and the course of the sun, it is obvious that designs for houses ought similarly to conform to the nature of the country and to the diversities of climate." Vitruvius notes that the effects of climate are "not only discernible in nature, but they also are observable in the limbs and bodies of entire races."[2] He proceeds to draw an analogy between architecture and body size, complexion, hair color, and vocal pitch at different latitudes.

Such a position on difference in relation to location could have skewed the history of architecture as we know it. However, the true hierarchy present in Vitruvius's treatise is revealed when, in the chapter that follows, he writes that "symmetry and order are primary, and only after these considerations have been made, should one consider the nature of the site (as well as use and beauty)."[3] This is an important moment to pause, and acknowledge the coup won by symmetry and order over responsiveness at this early moment.

Vitruvius' hierarchy would prove difficult to challenge. Even today, the dominance of order and symmetry remains pervasive in architecture and has been a trap that has routinely befallen architects. It is still precisely this hierarchy (and the preconceived notions of form with which they are associated) that limits architecture's ability to respond adequately to its environment.[4]

If we accept the notion that architecture is always dominated by the aesthetic (even when it claims not to be), we might also note that it suppresses the aesthetic of its responses in favor of its aesthetic of itself. That is to say: architecture can and does reduce energy loads, collect rainwater, shelter behind screens, and so on, but has not really taken ownership of how those operations might communicate the idea of their function.

With the current and longstanding hierarchy in place, sustainable architecture is a wolf in sheep's clothing, trying desperately to fit into some existing image of a contemporary world order passed down from modernism: formal order, transparency, symmetry, and so on. It is clear that preconceptions, collectively referred to here as 'order,' are at the top of the list. For a true sustainable architecture, the order of 'order' must be challenged.

For this we return to an old architectural debate: one of form vs. function. In opposition to an architecture of expressing order, a functionalist approach aims to express what the architecture does, whether literally or metaphorically: typically in the expression of its parts (stairs, structure), in the showing its inhabitants (machines, workers) or in the production of signs of its own manufacturing in the architectural elements.

In his definition of architectural functionalism, historian and theorist Adrian Forty charts the emergence and multifarious meanings of function from the 18th century. It is remarkable that, in tracking a workable definition of functionalism for architecture, Forty rediscovers a biological link in the term's point of origin.

BIOLOGICAL FUNCTIONALISM

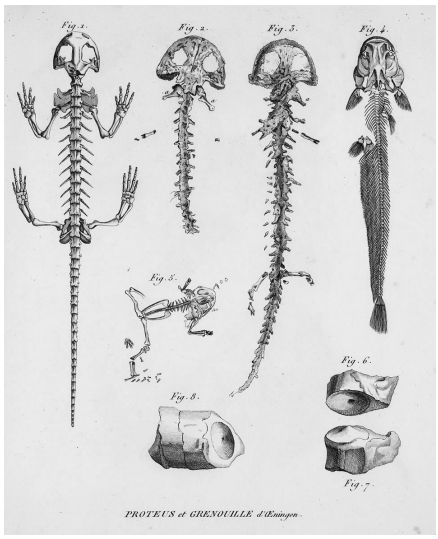
In the early 19th century, the argument between structuralism and functionalism in biology emerged through various opposing terms: order vs. purpose; formalism vs. functionalism; order vs. teleology; form vs. adaptation; and perhaps most tellingly, Geoffroy's Unity of Type vs. Cuvier's Conditions of Existence.[5] Whatever the terminology, the formalists believed that form had a specific and limited ability to carry out particular functions, which, if successful, resulted in the survival of the organism. On the contrary, functionalists argued that function was primary in survival, and that form adapted to allow functionality to occur.

Lamarck and Darwin, despite their differences, were both functionalists who believed that it was the function of the organism responding to changing environmental circumstances that defined the form. Even while new notions of evolution were embraced, however, formalist arguments persisted. Étienne Geoffroy Saint-Hilaire, for example, in 1829, while accepting notions of generation and transformation, believed that evolution was governed by laws of structure and archetypal form. He argued that, "animals have no habits but those that result from the structure of their organs…"[6]

In defense of functionalism, few were as adamant as French naturalist and zoologist Georges Cuvier, who understood organisms as "discrete, untransformable entities, designed for specific conditions of life and no other."[7] So strong was his conviction, in fact, that Cuvier opposed the idea of continuous evolution (a trajectory that was later to be taken up by William Bateson), due to the lack of functionality that was inevitable between states of high-function, as well as the impossibility of all related componenets transforming simultanesouly.[8]

The fundamentality of the form-function debate is nicely summarized in the 1869 publication, *Typical Forms and Special Ends in Creation*, whose Greek inscription on title page *typose lai telos* (type and purpose) summarizes the thrust of the argument. Reverend James McCosh and George Dickie described the simultaneity and inevitability of the two poles thus: "In taking an enlarged view of the constitution of the material universe, so far as it falls under our notice, it may be discovered that attention…is paid to two great principles or methods of procedure. The one is the Principle of Order, or a general plan, pattern or type, to which every given object is made to conform with more or less precision. The other is the Principle of Special Adaptation, or particular end, by which each object, while constructed after a general model is, at the same time accommodated to the situation which it has to occupy, and a purpose which it is intended to serve. These two principles…meet in the structure of every plant and every animal."[9]

In Georges-Louis Leclerc Comte de Buffon's *Histoire Naturelle* in 1749 and Carl Linnaeus's *Species Plantarum* in 1753, plants and animals had appeared classified, categorized, and tabulated (Buffon by historical evolution, Linnaeus by reproductive organs).[10] Whatever their system, the tendency had been to identify and describe formal characteristics normal to each type.[11] On the contrary, Cuvier's *Leçons d'Anatomie Comparée* (1800-05) reorganized the typical taxonomic order



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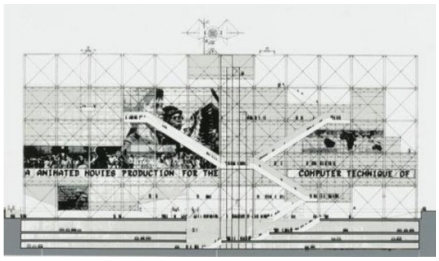

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Figure 2: Plate from Cuvier's *Leçons d'Anatomie Comparée* (1800-05).

Figure 3: Brinkman & Van der Vlugt, Van Nelle Factory, Rotterdam, 1925-31.

Figure 4: Renzo Piano and Richard Rogers, Centre georges Pompidou, Paris, 1971-77 © NJIT.

of the natural history catalog and instead considered organ systems in operational (versus morphological) terms. Rather than classifying bodily organs by the criteria of appearance and position, Cuvier thought it more accurate to first identify a given organ's 'function' within the larger body of the organism and then determine its place in the system, in order to understand the relationship of an organ to the sum of its parts. The collection is thus organized by a series of actions or functions instead of objects or forms, beginning with locomotion, and followed by sensation, digestion, circulation, respiration, voice, generation, and finally, excretion.

It is well known that the graphic techniques and the classification procedures of the early taxonomists were soon borrowed from the natural scientists by architects. Francois Leroy and then Jean-Nicolas-Louis Durand published treatises in which architecture was taxonomically organized and like-forms were presented as types or species. And, as in the natural science treatise, differences and variations were eliminated in order to deduce the basic model of the type. Architectural types were stripped down to their bare essentials in order that the designer could build up more complex forms from a solid conceptual base. Although type is presented textually by Durand as programmatic, his diagrams reveal the inevitable truth: that type, and therefore the fundamentals of architecture, are based on geometry. Or, as Giulio Carlo Argan suggests in On the Typology of Architecture, "the initial geometric move is the type."[12]

Cuvier's shifting of the emphasis from form to function begs the analogical question in architecture: What if the architectural analysis were to be carried out according to Cuvier's functionalist terms instead of according to the typical formalist terms? And, conversely, what if design was built-up using this functionalist approach?

Consider, then, a kind of architectural functionalism today, one which recalls its biological origins and thinks of architecture as an inevitable expression of its systems, regardless of any aesthetic preconception. Evolutionary biology is a particularly useful model here because function in the biological system does not stop at the bounds of an animal, but inevitably extends to the world around it, so that both animal and environment become part of one system. The functions inherent in the environment are just as important as the functions within the organism and, in fact, they drive the production of functional and formal transformations.

While functionalism has had various manifestations, the 'function' expressed has more often than not emerged from the architecture itself: its structure, its tectonics, and so on. In biology, however, function reaches out beyond the organism itself and is inevitably in dialogue with the environment.

ECOLOGICAL FUNCTIONALISM

In *The Ecological Approach to Perception*, James Gibson describes his 'Theory of Affordances,' which describes a perceptual world in which functionality is primary. An affordance, Gibson explains, is a use-quality contained within both the perceived world and the perceiving animal that stimulates a process of simultaneously occurring projection and consumption that together produce meaning. The function of the encountered object, Gibson proposes, is perceived before the color, the form, or the shape of object. For example, the physical properties of flat horizontal rigid and extended afford standing or walking: it is walk-on-able. Affordance, however, does not reside completely in the object but in the relationship of the object with the perceiving body. Affordance, Gibson posits, "cuts

across the dichotomy of subjective-objective and…is equally a fact of the environment and a fact of behavior…is both physical and psychical, yet neither."[13] To an animal, the affordances contained within its niche are things that are eat-able, drink-able, breath-able, shade-able, conceal-able, and so on. These affordances are linked to specific perceptual and functional components within the animal: the animal's sense of smell as it relates to the affordance of eat-ability in an object, and that object relating to the shape and function of its mouth, stomach, and eventually to the entire organism, and back into the environment. In other words, "All the organs of plants as well as of animals owe their form and their distribution of materials to their meaning as utilizers of the meaning factors which come to them from the outside."[14]

If architecture is allowed to stand in for the animal, as has often been suggested,[15] it too requires a method of perceiving and adjusting to its affordances, and also to its systems of consumption. A series of questions that probe architecture's relationship to the environment arise. For instance: What does sunlight afford architecture, for example, and how might architecture respond to maximize or minimize its affect? What does rainwater afford and how might architecture respond? What do views afford and how might they change architecture?

Such destabilization of the aesthetic-dominated hierarchy has been approached many times before, for example, in the surprising context of the English picturesque. Proponents of this movement advised that architecture should respond primarily to the surrounding landscape, and should offer the possibility that "functional equipage might become architectural expression and a culture of forms."[16] That is, the parts might not express the essence of their own utility: rather, the overall form of the architecture aggregates as its parts are arranged according to their relation with utilities beyond themselves, in their surroundings. While this seemingly radical suggestion appears poised to escape the bonds imposed by aesthetic preconceptions of form, this movement, like the many destabilizing attempts that followed, was waylaid by the predominance of the 'castle' aesthetic in its lineage. Too quickly, picturesque architecture became synonymous with its image, and lost touch with its responsive origins.

Nevertheless, the intention is one whose spirit we might uphold today by the production of an architecture that expresses its function, not only within itself, but in relation and dialogue with a larger field. The legibility of this architecture, although everywhere different, depending on climatic and local features, would read as pulled, stretched, budged, asymmetrical, disordered.

OMA'S design for the Whitney Museum addition in 2008 is a surprising example here. The firm is certainly not known for their environmental concerns and neither do they attempt to engage those concerns here. Nevertheless, in formal terms, the architecture seems to be awkwardly negotiating its visible and invisible context, derived out of local needs, and not a preconceived notion of order. That is to say: the architectural tectonic language can be found within the phenomena of the site, whether visible or invisible. Or conversely, the architecture points outside of itself towards its site.

In a similar manner, an ecological functionalist architecture would destabilize the position of 'order' at the top of the hierarchy, in favor of an architecture that not just responds to its environment, but expresses its response in an architectural language.

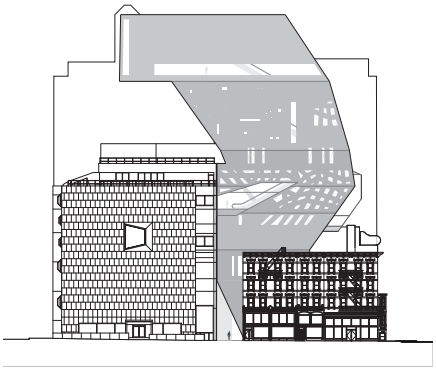

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Figure 5: OMA Whitney Museum Extension, New York. © OMA, 2008.

ENDNOTES

* See Caroline O'Donnell, *Niche Tactics: Generative Relationships between Architecture and Site*, New York: Routledge, 2015.

1 Jonathan Massey, The Gherkin: How London's Famous Tower Leveraged Risk and Became an Icon (Part 2), 12 Nov 2013. http://www.archdaily.com/447205/the-gherkin-how-london-s-famous-tower-leveraged-risk-and-became-an-icon-part-2/. "By thematizing its environmental control systems and energy consumption features, Swiss Re's new UK headquarters at once highlights climate risk and demonstrates the company's commitment to managing that risk through practices of sustainability, construed as a strategy for managing the business risk posed by environmental degradation and climate change. The building's ostentatiously streamlined form, tinted glass spirals, and visibly operable windows call attention to its capacity for supplementing or substituting mechanical ventilation with natural ventilation."

2 Vitruvius, The Ten Books on Architecture, Transl. Morris Hicky Morgan, (New York: Dover 1960), 170.

3 Ibid., 174.

4 Renaissance translations of these ideas, found in the many architectural treatises that proliferated around 1500 years after Vitruvius, tend to be much more pragmatic. Alberti, in his first book of The Art of Building in Ten Books, devotes parts three through ten to careful consideration of the details—both in nature and in human cultural life—that constitute the site, which he refers to more precisely as locality and area. In so doing, Alberti advises the architect to make both calculations and observations before determining the architectural cdesign and orientation. He suggests that elements of the existing context can and perhaps should determine early decisions in the process of architectural production. This predetermined object, however, is a far cry from Vitruvius' unexplored allusion to site-motivated variation in morphology, materiality, and temperament, but understandably so, since such an exploration had been made impossible by the predominance of formal rules over morphological responsiveness.

Although more than one hundred years old, the 19th century words of Leopold Eidlitz might be reimagined as a contemporary call for the return of function to the top of the hierarchy of architectural expression. Eidlitz wrote:

"All natural organisms are possessed of the mechanical ability to perform certain functions. This ability we find more or less clearly expressed in their forms as a whole or in their crystallization. In this way, they convey to the mind an expression of these functions and thus they tell the story of their being. "[17]

If one of architecture's fundamental qualities is to communicate meaning, to tell a story, the question for architects today is: which story to tell? Eidlitz proposes following nature, by allowing architecture to tell the true story of its function instead of the fiction of its form. Doing so would allow architecture to truly respond to its climatic context, and would allow a new language of architecture to emerge from the current motley crew of styles.

5 Stephen Jay Gould, The Structure of Evolutionary Theory, (Cambridge: The Belknap Press of Harvard University Press, 2002), 261.

6 E.S. Russell, Form and Function, (London: J.Murray, 1916), 77.

7 Georges Cuvier, Leçons d'Anatomie Comparée, (recueillies at publiées sous ses yeux par C. Duméril. C. Duméril, éd. vol. 1-2; G.-L. Duvernoy, éd., vol 3-5, Paris, 1800-1805), 45-60.

8 Cuvier argued: if any part were to evolve, all parts would need to evolve. Gould agrees that, even today "no one can imagine a mechanism for such globally coordinated alteration." Stephen Jay Gould, The Structure of Evolutionary Theory, (Cambridge: The Belknap Press of Harvard University Press, 2002), 93.

9 James McCosh and G. Dickie, Typical Forms and Special Ends in Creation, (New York: Robert Carter and Bros., 1869), 1.

10 Leandro Madrazo, "Durand and the Science of Architecture," Journal of Architectural Education, Volume 48, Issue 1, 1994, 12.

11 Catherine Ingraham, Architecture, Animal, Human: The Asymmetrical Condition, (New York: Routledge, 2006), 41.

12 Giulio Carlo Argan, "On the Typology of Architecture" in Theorizing a New Agenda for Architecture: An Anthology of Architectural Theory 1965-1995, Ed. Kate Nesbitt, Princeton Architectural Press, New York, 1996, 242-6.

13 James J.Gibson, The Ecological Approach to Visual Perception (Hillsdale, New Jersey: Lawrence Erlbaum Assoc. Publishers, 1986), 129.

14 Jakob von Uexküll, A Foray into the Worlds of Animals and Humans, trans. Joseph D. O'Neill (Minneapolis: University of Minnesota Press, 2010), 151.

15 Le Corbusier considers the architect a "creator of organisms." Le Corbusier, Towards a New Architecture, 1927, Trans. Frederick Etchells, (New York: Holt, Rinehart and Winston, 1986), 103.

16 John Macarthur, The Picturesque: Architecture, Disgust and Other Irregularities (New York/London: Routledge, 2007), 146.

17 Leopold Eidlitz, The Nature and Function of Art, More Especially of Architecture (London: Sampson Low, 1881), 223-224.